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PRODUCTION AND USE OF CLASSROOMS ON FILM VERSUS TRADITIONAL OBSERVATIONS IN TEACHER EDUCATION, FINAL REPORT.

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THIS PROJECT WAS DESIGNED TO EVALUATE THE POSSIBLE AND EFFECTIVE USE OF AUTHENTIC AND UNREHEARSED CLASSROOM FILMS IN LIEU OF DIRECT CLASSROOM OBSERVATION. TWO CONTROL AND TWO EXPERIMENTAL GROUPS WERE ARRANGED WITHIN AN EDUCATIONAL PSYCHOLOGY COURSE, AND A NEW SYLLABUS WAS PRODUCED. NEW TESTS WERE DEVISED TO MEASURE MORE ACCURATELY ANY DIFFERENCES THAT MIGHT OCCUR. THE PROJECT WAS PUT INTO EFFECT FOR THREE SEMESTERS, THE THIRD SEMESTER HAVING THE FULL COMPLEMENT OF NINE FILMS AND NINE OBSERVATIONS. RESULTS FROM THE FIRST SEMESTER SHOWED NO SIGNIFICANT DIFFERENCES. THE SECOND SEMESTER RESULTS SHOWED A STATISTICALLY SIGNIFICANT DIFFERENCE IN FAVOR OF THE FILMS, AND THE FINAL SEMESTER RESULTS SHOWED NO SIGNIFICANT ACHIEVEMENT DIFFERENCE BETWEEN THE TWO GROUPS. WHILE NO LARGE RESULTS IN FAVOR OF THE FILM SYSTEM WERE DEMONSTRATED USE OF THE FILMS--(1) SAVED A GREAT DEAL OF STUDENT TIME, (2) ALLOWED FOR A LARGER VIEWING GROUP THAN COULD BE ACCOMMODATED IN A CLASSROOM, AND (3) ALLOWED FOR MORE INTELLIGENT STUDENT DISCUSSION BECAUSE OF COMMON OBSERVATION. (PM)

PRODUCTION AND USE OF CLASSROOMS ON FILM

versus

TRADITIONAL OBSERVATIONS IN TEACHER EDUCATION

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FINAL REPORT

on

A RESEARCH PROJECT CARRIED OUT AT THE UNIVERSITY OF AKRON WITH THE AID OF A GRANT FROM THE U.S. OFFICE OF EDUCATION UNDER THE PROVISION OF TITLE VII OF THE NATIONAL DEFENSE ACT OF 1958

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by

William I. Painter

THE UNIVERSITY OF AKRON

Akron 4, Ohio

June 30, 1961

ED003497

FOREWORD

Events of the past decade have brought forth hundreds of books and articles dealing with the problem of how best to educate America's teachers. Some of this material has been based upon fact but much is based upon nothing more realistic than fiction or individual opinion.

Preparing effective teachers for America's children is a challenge second to none. Educating prospective teachers for elementary and secondary schools in numbers sufficient to satisfy the demand poses practical problems the solutions to which must be based upon fact. To discover the answer to one teacher education problem was the purpose of this study.

Classroom observation is considered essential in teacher education, but crowded public schools plus large numbers of teachers in training inevitably lead to vexing matters of organization and proper scheduling.

Dr. William I. Painter recognized this problem early and suggested possible alternatives. Successful experience in the use of films designed to meet a laboratory problem in Freshman Chemistry on this campus encouraged him to propose the study he has described in this report.

His description of his quest for new answers for new problems is interesting. We are pleased to report the results to the United States Office of Education.

Norman P. Auburn
President

June, 1961

Production and Experimentation Personnel:

Dr. William I. Painter, Associate Professor of Education and Project Director

Mr. Robert Martin, Martin Productions and Ad-View, Inc.

Dr. Marvin Chrisp, Instructor in Education

Dr. Helen W. Painter, Associate Professor of Education

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Mr. William Mavrides, University TV Coordinator

Dr. Chester T. McNerney, Dean of the College of Education

Dr. Thomas Sumner, Dean of the Buchtel College of Liberal Arts

Cooperating School Principals:

Miss Virginia Lloyd ..... Spicer Elementary School
Akron, Ohio

Mr. Dale Campbell ..... Young Elementary School
Springfield Township, Summit County, Ohio

Mrs. Eloise Halliburton ..... Windemere Elementary School
Akron, Ohio

Mr. Sumner Vanica ..... Perkins Junior High School
Akron, Ohio

Mr. Mardis Williams ..... Kenmore High School
Akron, Ohio

Mr. Harland Horton ..... Garfield High School
Akron, Ohio

Participating Teachers:

Mrs. Bessie Miller ..... 1st Grade

Mrs. Winifred Shahan ..... 2nd Grade

Miss Joan Davidson ..... 3rd Grade

Mrs. Charlene Weber ..... 4th Grade

Mrs. Sara Bohn ..... 5th Grade

Mr. Robert Morgan ..... 6th Grade

Mrs. Edna Weiss ..... 8th Grade

Mr. Ira Eplin ..... 10th Grade (English)

Mr. David Hardwick ..... 10th Grade (Chemistry)

Introduction

Currently in the teacher education program in the United States much attention is given to classroom visitation and so-called laboratory experience during the pre-student teaching period. The most common practices for meeting this early demand are:

1. To have the college class crowd into a public school classroom to view a demonstration lesson.

2. To have students trek to various schools in the surrounding territory for individual observations.

It cannot be denied that each of these practices has value, but certain weaknesses are also apparent. As commonly carried out, the demonstration lessons are performed in an unrealistic atmosphere and the demonstrators attempt a degree of attainment that can scarcely be maintained effectively each day. The classroom activity often becomes more teacher centered than it should be, according to current education theory. In the individual observation procedure, since the college instructor cannot be in several places at once, it is almost impossible for him to know what the students have had an opportunity to see in the many classrooms which they visit simultaneously.

Very few teacher training institutions have sufficient facilities or adequate control over them to meet the demands of the extensive professional program now recommended by educational leaders. One partial solution to the problem is the building of special observation rooms adjoining classrooms in a laboratory school — a one-way glass partition allowing the observation of school in progress in a natural setting. Another practice which shows promise is the use of closed circuit television to show what is going on in a public school classroom to one or more college classes simultaneously. Unfortunately, not many colleges can obtain such accommodations or the finances to put such programs in operation.

Commercial films have been produced to show certain specific aspects of child behavior in and out of school and to present specific classroom activities. Though they are of value, most of them are over-simplified, dramatic presentations, including much that is idealistic or unreal, at least by implication.

Furthermore, some of the most important happenings in the classroom do not lend themselves to either dramatization or demonstration. The success of a teacher may depend as much or more on his familiarity with and anticipation of these events than upon what he gains from formal, carefully designed demonstrations. Thus, the prospective teacher needs to see the unusual as well as the usual and the commendable along with the undesirable occurrences if he is to be educated to face problems of reality in the classroom.

It would seem that a very effective way of introducing this element of realism into the instructional pattern would be to make use of a series of films sampling the normal activities of a public school classroom. As these would be viewed and discussed in the college class, students and instructor alike would have common experiences for analysis and evaluation. Differences of perception could be reduced at least by providing opportunity for viewing the film more than once. Such a program should result in a more effective use of the time now allotted to observations and classroom discussion of them.

The Problem

The foregoing thoughts led the author to initiate an application for a Federal grant to help finance the production of sound motion picture films of public school classrooms and to test out their worth as a substitute for direct classroom visitation.

The objectives as set forth in the application were as follows:

1. To determine the practicality of using films made of normal school performance in lieu of direct classroom visitation by the student as an effective way of making a professional education course meaningful.
2. To gather evidence as to whether such use of films can be of service in caring for the expanding enrollment in teacher education.
3. To test out the theory in a course in Educational Psychology (Human Development and Learning) which must be taken by all prospective teachers early in their professional program.

General Plan of Procedure

The general aspects of the procedure were as follows:

1. Produce nine films of representative classroom activities, such as might occur in a normal school day. Six of these were to be made at the elementary school level, one at the junior high school level and two at the senior high school level. The activities were to be unrehearsed and involved little more pre-planning than would occur normally for daily classroom work.
2. Build a syllabus for the course involved so that instruction could be kept fairly uniform in the college classes participating in the experiment.
3. Design tests with intent to measure as accurately as possible the multiple objectives of the course with emphasis on understanding and critical thinking.
4. Arrange for two control and two experimental groups of approximately equal size in the course for each semester in which the experiment was being conducted. The control groups were to do direct observation in the classrooms and the experimental groups were to see the classrooms on film instead. No attempt was to be made to pair individual students.
5. Assign each instructor a control group and an experimental group for each semester.
6. Give the common tests at both the beginning and end of each semester.
7. Compare the test results on the control and experimental groups by the analysis of co-variance technique.

Detailed Description of Progress

Building the course outline

Work on the project began July 1, 1959. The first task performed was to develop a new syllabus for the Educational Psychology course, which at The University of Akron is now called Human Development and Learning. (This is the course in which the experiment was conducted.) During July and August of 1959, fourteen recent texts in the field were analyzed in great detail. All topics discussed were placed on cards which were later sorted under nine major categories. These major categories were determined partly by an earlier agreement of a committee of the College of Education and partly by the data from the textbook references. The following are the headings which were adopted for this outline.

I. Introduction

II. Meaning of Human Behavior

III. The Organic Bases of Behavior

IV. Growth of Intelligence—Learning

V. Cultural Origins and Social Growth of the Individual

VI. Human Personality

VII. Stages in Growth and Development

VIII. Teaching Procedure

IX. Evaluation—Purposes and Tools

Under each of these divisional headings, sub-topics were listed and under each sub-topic, questions were devised. Answers to these questions would require comprehensive familiarity with the content materials. Furthermore, the intent of the design of these questions was to assure understanding and stimulate critical thinking. (The entire syllabus is 38 pages in length with double-spacing between topics and questions and single spacing within each question.) This syllabus was ready for use in all sections of this course at the beginning of the second semester, 1959-60. In addition to the syllabus, several other tasks were worked on simultaneously during the first semester, 1959-60.

Production of films

One major consideration was that of making arrangements for the production of the films. Permission from public school officials had to be secured and approval of locations and rooms that might be used had to be obtained. These rooms had to be visited and checked for space, lighting and acoustics, plus consideration of the teacher's willingness for such activity to be engaged in within her classroom. With the assistance of the Dean of The University of Akron's College of Law, legal release forms to be signed by parents and teachers were drawn up.

We may point out here that we had excellent cooperation from public school officials and from teachers and parents. Pupils also cooperated well. Naturally, the pupils would not behave normally was not justified. Much of this normalcy of classroom behavior can be attributed to the smooth way that Mr. Martin worked with children and to the fact that equipment was tested in the elementary classrooms a few days before we actually put film in the cameras.

These details took more time than had been anticipated; so it was not until the middle of November that a contract was signed with Mr. Robert Martin for taking the sound motion pictures in the classrooms. Incidentally, Mr. Martin had been advising us on technical matters, even on our original estimates of costs before the application for Title VII funds was made. Yet this type of film making was also new to him and many problems arose which none of us expected. For example, balancing sound in an active classroom with relatively poor acoustics was far more difficult than sound control in a television studio or for narrated films. These had been the chief types of successful experience which Mr. Martin had previously had.

It was thought that bulky equipment had to be concealed, or else the attention of children would be too much distracted by the three adults operating sound equipment and cameras. Thus a booth was designed and constructed. After the first two films were made, we decided that the booth was not necessary and we ceased to use it.

The "clap-stick" so frequently used in commercial photography for synchronizing sound tape and picture film could not be used, we thought, because of the distracting effect. Thus a special electronic mixer was designed and ordered by the photographer. It was well into January before this equipment was obtained. (When we reached the junior high school level, we returned to using the "clap-stick" and did not find its use to be significantly distracting.)

Then we ran into much bad weather. Dark, cloudy days made it impossible to shoot color film in the classroom without introducing more artificial lighting than the electric current in most school buildings will carry without interfering with sound synchronization—producing an erratic sound drag resulting in voice garbling.

One film of a first grade room was taken in February and one of a fourth grade room in March. They are useable, but not excellent technically, largely because of the low light level in the rooms. There was also too much difference in light from the window side to the inner wall of the rooms. Even though we were using Super-Anscochrome film, we found it necessary to increase the developing time so much that too much grain appeared in the picture. Furthermore, this grain on the film interfered with the clarity of the sound track to some degree. We had not been able either, to control the acoustics in the rooms sufficiently to prevent extraneous noises from being distracting, thus making it difficult to hear the voices clearly. Microphones pick up all sounds in a room, even the turning of pages in books, and appear to intensify them.

During our effort to find better situations for taking films, we discovered finally, during the summer of 1960, a suburban elementary school where we could convert a stage into a classroom and resort entirely to the use of artificial light. Here we could use the regular stage lights and add four 1500-watt flood lights. We thought that the stage draperies would help to deaden the extraneous sounds.

In October, the photographer was able to obtain three 400-foot rolls of Hi-Speed artificial light Ektachrome film. With this film, we were able to take our third picture in a sixth grade classroom. It is reasonably good, though we were unable to balance the lighting over the entire room as well as we would have liked.

After this third film had been made, we were well enough satisfied to plan filming more rooms in this setting. However, we were unable to obtain more of the same type of film from the factory or dealer. It seems that the demand for this new film had been greatly underestimated.

Since we had the arrangements made at this school and three other teachers and their pupils were already adjusted to the situation, we decided to proceed with filming on fast black and white film. Parts of these are good and parts are disappointing. The lack of light balancing affected this type of film more adversely than it did the color film. The lower grades were a little more restless than the sixth grade was and all the normal noises were intensified on the sound track. These films were, however, satisfactory for our use.

We were able to use all six of the films mentioned above during the first semester of 1960-61. We still had not made the three secondary school films. By the end of January, our television studio on The University of Akron campus was completed. It seemed wise for us to convert it to our use if possible.

Arrangements were made for transporting the secondary school classes to our studio and filming them while they engaged in near normal classroom activities. We used regular Ektachrome film, twelve 1500-watt flood lights, some spot lights, and three microphones. The results are, we think, of commercial quality with regard to both picture and sound.

Making the tests

Another major activity in which we engaged in the fall of 1959-60 was the making of a measuring instrument to use to determine whether any real differences would occur as the result of using films versus direct classroom observation in the Human Development and Learning classes. As bases for making such a test we relied not only upon our own outline of objectives and content, but also upon many workbooks and test materials which textbook publishers kindly provided for our use. Both were our guides in the construction of a test which purported to emphasize the measurement of understanding and critical thinking in the area.

The test questions made were tried out during the first semester of 1959-60 in three classes. Two tentative tests were made, one to cover essentially the first half of the course and the other, the second half. The first test contained 106 questions, fifty-nine true-false and forty-seven multiple choice. The second test contained 110 questions, sixty true-false and fifty multiple choice. These tentative tests were given during the first semester and at the beginning and end of the second semester to more than 160 students. An item analysis of the results of the end-of-the semester testings was made, using estimates of point-biserial r as obtained from H. F. Dingman's abac chart, with 50% of the cases on either side. Almost all of the test items showed a positive r, but several seemed to have practically no discriminatory value.

A thorough re-study of the test questions led to re-vamped tests which were used during both semesters of 1960-61. Test I is made up of eighty-four questions, of which thirty-four have a bi-serial r of .30 or above, thirty-five have a bi-serial r of .20 up to .30 and fifteen have values of .10 up to .20. Test II has seventy-six questions, of which twenty-two have a bi-serial r of .30 or above, thirty have a bi-serial r of .20 up to .30 and twenty-four have values from .10 up to .20.

We recognize that some of these r values are too low to be highly significant according to statistical analysis, but we included no question which did not also show positive correlation with total scores for each semester of 1959-60. We also recognize that more than 160 cases are desirable in determining such values, but we used all the cases (or students) which we had to date and we deemed it unsound practice to use students not following our common course outline.

Procedure and Results of First Semester of Actual Experiment

At the beginning of the second semester, February, 1960, the day classes in Human Development and Learning were divided into four sections. One experimental and one control group were taught by the director of the study and two sections, one control and one experimental, by Mr. Marvin Chrisp. It was not possible to balance the enrollments exactly in the groups, but we did have 46 cases in the control groups and 44 cases in the experimental groups. The classes were taught as identically as possible except with the control group doing six direct classroom observations and the experimental group seeing and discussing the two films produced during the semester.

Both control groups were combined as Group A and both experimental groups as Group B. "X" represents the initial test scores and "Y", the final test scores in each group. The following is the statistical pattern used and the computed results for this first period of the study.

Group A (Control)		Group B (Experimental)	
X_a	Y_a	X_b	Y_b
Σ = 4897	5690	4932	5819
M = 106.46	123.7	112.09	132.25

Total Sum of X (a and b) = 9,829 Total Mean $\overline{X}_t$ = 109.21

Total Sum of Y (a and b) = 11,509 Total Mean $\overline{Y}_t$ = 127.88

Total sum of the squares of X
(Squares of the deviations of each from $\overline{X}_t$) = 30,325.25

Total sum of the squares of Y
(Squares of the deviations of each from $\overline{Y}_t$) = 41,045.70

Within the groups sum of the squares of X = 29,479.24

Within the groups sum of the squares of Y = 39,510.31

*Total sum of the products = 24,519.32

*Within-groups sum of products = 23,439.39

*The sums of products were derived as follows:

(a) $\Sigma X Y = \Sigma X_a Y_a + \Sigma X_b Y_b =$
$683,521 + 617,909 =$ 1,291,430

(b) Total ΣX (a and b) =
$4897 + 4932 = 9,829$
Total ΣY (a and b) =
$5690 + 5819 = 11,509$
Total ΣX times total ΣY =
Total number of pairs

$$\frac{9,829 \times 11,509}{90} = \frac{113,121,961}{90} = 1,256,910.69$$

(c) $$\frac{\Sigma X_a Y_a}{N_a} = \frac{4897 \times 5690}{46} = \frac{27,863,830}{46} = 605,733.61$$

$$\frac{\Sigma X_b Y_b}{N_b} = \frac{4932 \times 5819}{44} = \frac{28,699,308}{44} = 652,257.00$$

Total = 1,257,990.61

(d) a — b = 24,519.32 (Total Sum of Products)

(e) a — c = 23,439.39 (Within-Group Sum of Products)

Sum of the squares of the residuals about the total line of regression Y on X is represented by $\Sigma y'^2$.

$\Sigma y_t'^2$ = total sum of squares of Y minus total sum of products squared divided by total sum of squares of X.

$$\Sigma y_t'^2 = 41,045.70 - \frac{(24,519.32)^2}{30,325.25} =$$

$$41,045.70 - \frac{601,197,053.26}{30,325.25} =$$

41,045.70 — 19,824.97 = 21,220.73

The sum of squares of residuals about the common within-group regression line is represented by $\Sigma y_w''^2$.

$\Sigma y_w''^2$ = Within-group sum of squares of Y minus the within-group sum of products squared divided by the within-group sum of squares of X.

$$\Sigma y_w''^2 = 39{,}510.31 - \frac{(23{,}439.39)^2}{29{,}479.24} =$$

$$39{,}510.31 - \frac{549{,}405{,}003.57}{29{,}479.24} =$$

$$39{,}510.31 - 18{,}640.30 = 20{,}870.25$$

The sum of the squares which may be attributed to the differences among the final means independent of initial differences is represented by

$$\Sigma y_m''^2 = \Sigma y_t''^2 - \Sigma y_w''^2$$

$$\Sigma y_m''^2 = 21{,}220.73 - 20{,}870.25 = 350.48$$

$$F_{k\text{-}1,\ N\text{-}k\text{-}1} = \frac{\Sigma y_m''^2/k\text{-}1}{\Sigma y_w''^2/N\text{-}k\text{-}1)}$$

$$F_{1,87} = \frac{350.48/1}{20{,}870.25/87}$$

$$= \frac{350.48}{239.90} = 1.46$$

$$t = \sqrt{1.46} = 1.21$$

It will be noted from the above analysis of variance that there was a positive difference between the two groups, but the significance of that difference is statistically far below the five per cent confidence level. Comparison of the means of the two groups does indicate that the experimental group did on the average excel.

Procedure and Results of the Second Semester of Experimentation

The first semester of the experiment as described above was considered to be more or less a "trial run." During the fall semester of 1960-61, we had 61 cases in the combined control groups and 69 cases in the combined experimental ones. We had six elementary school films to use before the end of the semester to be matched with a comparable number of observations by the students in the control groups. The statistical processes used and the calculated results are developed below in the same manner as they were shown for the first period.

	Group A (Control)		Group B (Experimental)	
	X_a	Y_a	X_b	Y_b
$\Sigma =$	4568	5347	5229	6653
$M =$	74.885	87.655	75.782	96.420

Total sum of X (a and b) = 9,897 Total Mean $\overline{X_t} = 75.362$

Total sum of Y (a and b) = 12,000 Total Mean $\overline{Y_t} = 92.308$

Total sum of the squares of X

(Squares of deviations of each from $\overline{X_t}$) = 29,584.01

Total sum of squares of Y
(Squares of deviations of each from $\overline{Y}_t$) = 49,924.40

Within the groups sum of the squares of X = 29,557.92

Within the groups sum of the squares of Y = 47,466.58

*Total sum of the products = 25,370.54

*Within the groups sum of products = 25,113.21

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*The sums of products were derived as follows:

(a) $\Sigma X Y = \Sigma X_a Y_a + \Sigma X_b Y_b =$
410,953 + 518,756 = 929,709

(b) Total Sum of X (a and b) = 4568 + 5229 = 9,797

Total Sum of Y (a and b) = 5347 + 6653 = 12,000

$$\frac{\text{Total } \Sigma X \text{ times total } \Sigma Y}{\text{Total number of pairs}} =$$

$$\frac{9797 \times 12{,}000}{130} = \frac{117{,}564{,}000}{130} = 904{,}338.46$$

(c) $\frac{\Sigma X_a Y_a}{N_a} = \frac{4568 \times 5347}{61} = \frac{24{,}425{,}096}{61} =$ 400,414.10

$\frac{\Sigma X_b Y_b}{N_b} = \frac{5229 \times 6653}{69} = \frac{34{,}788{,}537}{69} =$ 504,181.69

Total = 904,595.79

(d) a — b = 929,709 — 904,338.46 = 25,370.54

(e) a — c = 929,709 — 904,595.79 = 25,113.21

The sum of the squares of the residuals about the total line of regression Y on X is represented by $\Sigma y''^2$.

$\Sigma y_t''^2$ = total squares of Y minus total sum of products squared divided by total sum of squares of X.

$$\Sigma y_t''^2 = 49{,}924.40 - \frac{(25{,}370.54)^2}{29{,}584.01} =$$

$$49{,}924.40 - \frac{643{,}664{,}299.89}{29{,}584.01} =$$

$$49{,}924.40 - 21{,}757.17 = 28{,}167.23$$

The sum of squares of residuals about the common within-group regression line is represented by $\Sigma y_w''^2$.

$\Sigma y_w''^2$ = Within-group sum of squares of Y minus the within-group sum of products squared divided by the within-group sum of squares of X

$$\Sigma y_w''^2 = 47{,}466.58 - \frac{(25{,}113.21)^2}{29{,}557.92} =$$

$$47{,}466.58 - \frac{630{,}673{,}316.50}{29{,}557.92} =$$

$$47{,}466.58 - 21{,}336.87 = 26{,}129.71$$

The sum of the squares which may be attributed to the differences among the final means independent of initial differences is represented by

$$\Sigma y_m''^2 = \Sigma y_t''^2 - \Sigma y_w''^2$$

$$\Sigma y_m''^2 = 28{,}167.23 - 26{,}129.71 = 2{,}037.52$$

$$F_k\text{-}1,\ N\text{-}k\text{-}1 = \frac{\Sigma y_m''^2/k\text{-}1}{\Sigma y_w''^2/N\text{-}k\text{-}1}$$

$$F_{1},127 = \frac{2{,}037.52/1}{26{,}129.74/127} =$$

$$\frac{2{,}037.52}{205.75} = 9.9$$

$$t =)\overline{9.9} = 3.10$$

The F- or t-value thus derived indicates that during this second period of the experiment the difference between the groups was statistically significant beyond the 1% confidence level. The difference is in favor of the use of the films in lieu of direct classroom observations by the students.

Procedure and Results of the Final Semester of Experimentation

During the third and final period of the experiment in the second semester of 1960-61 we had 60 cases in the combined control groups and 67 cases in the combined experimental groups. We were able to use appropriately with the experimental groups the entire complement of nine films which we had made, and we matched these with nine observations made by students in the control groups. The following is a statistical analysis of the results:

	Group A (Control)		Group B (Experimental)	
	$\overline{X_a}$	Y_a	$\overline{X_b}$	Y_b
$\Sigma =$	4510	5745	5040	6410
$M =$	75.167	95.75	75.224	95.67

Total sum of X (a and b) = 9,550 — Total Mean $\overline{X_t}$ = 75.197

Total sum of Y (a and b) = 12,155 — Total Mean $\overline{Y_t}$ = 95.709

Total sum of the squares of X
(Squares of deviations of each from $\overline{X_t}$) = 35,388.359

Total sum of the squares of Y
(Squares of deviations of each from $\overline{Y_t}$) = 41,078.220

Within the groups sum of squares of X = 35,387.975

Within the groups sum of squares of Y = 41,067.026

*Total sum of the products = 28,355.28

*Within the groups sum of products = 28,355.42

*The sums of products were derived as follows:

(a) $\Sigma X Y = \Sigma X_a Y_a + \Sigma X_b Y_b = 446{,}605 + 495{,}768 = 942{,}373$

(b) Total sum of X (a and b) = 4510 + 5040 = 9,550

Total sum of Y (a and b) = 5745 + 6410 = 12,155

$$\frac{\text{Total } \Sigma X \text{ times total } \Sigma Y}{\text{Total number of pairs}} =$$

$$\frac{9550 \times 12{,}155}{127} = \frac{116{,}080{,}250}{127} = 914{,}017.717$$

(c) $$\frac{\Sigma X_a Y_a}{N_a} = \frac{4510 \times 5745}{60} = \frac{25{,}909{,}450}{60} = 431{,}832.500$$

$$\frac{\Sigma X_b Y_b}{N_b} = \frac{5040 \times 6410}{67} = \frac{32{,}306{,}400}{67} = 482{,}185.075$$

Total = 914,017.575

(d) a — b = 942,373 — 914,017.72 = 28,355.28

(e) a — c = 942,373 — 914,017.58 = 28,355.42

Sum of the squares of the residuals about the total line of regression Y on X is represented by $\Sigma y''^2$.

$\Sigma y_t''^2$ = total squares of Y minus total sum of products squared divided by total sum of squares of X.

$$\Sigma y_t''^2 = 41{,}078.22 - \frac{(28{,}355.28)^2}{35{,}388.36}$$

$$= 41{,}078.22 - \frac{804{,}021{,}903.88}{35{,}388.36}$$

$$= 41{,}078.22 - 22{,}719.95 = 18{,}358.27$$

Sum of the squares of the residuals about the common within-group regression line is represented by $\Sigma y_w''^2$.

$$\Sigma y_w''^2 = 41{,}067.03 - \frac{(28{,}355.42)^2}{35{,}387.98}$$

$$= 41{,}067.03 - \frac{804{,}029{,}843.38}{35{,}387.98}$$

$$= 41{,}067.03 - 22{,}720.42 = 18{,}346.61$$

The sum of the squares which may be attributed to the differences among the final means independent of initial differences is represented by

$$\Sigma y_m''^2 = \Sigma y_t''^2 - \Sigma y_w''^2$$

$$\Sigma y_m''^2 = 18{,}358.27 - 18{,}346.61 = 11.66$$

$$F_{k\text{-}1,\ N\text{-}k\text{-}1} = \frac{\Sigma y_m''^2/k\text{-}1}{\Sigma y_w''^2/N\text{-}k\text{-}1}$$

$$F_{1,124} = \frac{11.66/1}{18{,}346.61/124} = \frac{11.66}{147.96} = .0754$$

$$t = \sqrt{.0754} = .275$$

These F and t values indicate that the difference between the results obtained in the control and experimental groups during the final semester was insignificant. This was obvious also from the fact that both groups had almost identical means at the beginning of the experiment and also at the end of the experiment. The average gain in each group was approximately 20.5 points.

Summary and Conclusions

The original theory motivating this study was that the use of films of normal school classroom activities would contribute at least as much to student learning in a professional education course as would having students do direct observations in public school classrooms. This theory seems to be substantiated by comparison of the results of the initial and final tests which had been designed to measure progress toward the multiple objectives of the course Human Development and Learning. We can note that:

1. During the initial or trial period of the experiment the results leaned slightly in favor of the use of the films;
2. During the second period, the differences were statistically significant in favor of the films; and
3. During the final period, there was no difference between the achievement of the two groups.

One may wonder why the difference in achievement as measured by the tests reverted to zero during the third period of the experiment and we can only suggest some possible causes.

1. It is possible that the two instructors of the course may have unconsciously and unintentionally conveyed some of the benefits of viewing the films to the control groups and thus helped the students there to increase in their growth. This transfer could have occurred during group discussion through types of examples that might be given a great amount of recognition.
2. It is perhaps even more likely that the students of both groups had learned of the pattern of measurement from previous classes. Even though a close guard was kept on the tests at all times, this group of students knew from previous classes that the initial tests would also be administered at the end of the course. There was no way of concealing this fact. Thus the experience in taking the original tests may have served as a guide to study for this semester more than it did for those students who participated in the experiment during the first two periods.

Since the average starting point was almost identical for all groups for both semesters during which the revised form of the tests was used, it seems safe to assume that differences in sampling with reference to general readiness for the course did not significantly influence the end results.

Some other conclusions which have been suggested and supported by our experience are the following:

1. The use of the films in classes does save a great deal of student time. Some students in control groups even expressed the wish that they could see the films instead of making trips to various schools. On the other hand, some students in film classes wished that they could get into a classroom directly. For the latter, there seemed to be a fear that they might miss something very valuable if they were required to depart from the traditional pattern in their instructional program.
2. As instructors, we felt that the film had the advantage in that we and the students could all see the same activities and thus be able to discuss our observations more intelligently than we could in the non-film groups where we all had observed in different settings.
3. Wherever direct classroom visitation is unduly difficult to arrange, pre-prepared films of typical school activity can serve at least equally well.
4. It is possible often to provide film observation experience at a more opportune time than it is possible to arrange for direct observation in even the most cooperative school. Various public school functions which must be performed in carrying out responsibilities to the school's constituency often make timing of observations by college students very difficult. If the observation school is also used by the college or university as a demonstration school, the problem is intensified.
5. Film projection has no limit in itself with regard to the size of the viewing group that may be accommodated. Common observation experience can be provided for much larger college classes than could ever be provided simultaneously through the direct in-the-classroom observation procedure.
6. It is also quite obvious that good illustrations once placed on film can be used repeatedly, and the instructor, knowing what the students are going to see, can prepare them regarding what to look for with no doubt as to whether the students will have the opportunity of seeing it.

There are also a few points which we may cite regarding the production of films of such normal every-day classroom activity:

1. The limitations on the production of such films are almost entirely technical. These technical problems can all be solved, but will require a greater outlay of capital and labor than the amateur is likely to estimate.
2. Pupils adjust to the situation very quickly and soon pay little attention at all to what the photographer is doing. Those who are curious about the equipment are quickly satisfied by a short explanation of what they see operate. The pupil has nothing to gain or lose by his behavior; so he is relatively unconcerned by what goes on.
3. Teachers are a little more sensitive to the situation, but we did not find it difficult to find excellent teachers who were perfectly willing

to continue with their regularly scheduled teaching activity. They did not plan demonstrations in the usual sense of the word, though at our request, they tried to vary the nature of the activity frequently. They were willing to provide us with a rough sketch of their daily plans to serve as an aid to the photographer. (In some cases, the teacher did not even know when the cameras were started or stopped until told the filming was finished.)

4. Anyone attempting to produce such films should use an acoustically treated and adequately lighted studio as a classroom if one is available. Lighting entirely by artificial lights is much easier to control. It is much easier to get satisfactory color films and good sound tracks under such circumstances.

5. For those who wish to take sound, color motion pictures in a regular classroom, there are a few conditions which are absolutely essential. The room should be a bright one with excellent window lighting. A great deal more fluorescent light must be added than is found in the normal classroom especially near the inner wall. (It is possible to mix white fluorescent light with daylight on daylight color film without violent color distortion.) The electric current should be tested to be certain that it can carry the extra light load plus the camera motors and sound recorder without fluctuation or drag. Finally, special attention should be given to acoustical treatment of the best room that can be found, for even the book compartment of a pupil's desk can often become almost a drum under apparently normal pupil use of school materials.

From our experiences during the two years of the experiment, then, we learned that such films as we had planned can be made well, though we had underestimated the technical difficulties at the beginning. We were a great deal overconcerned about the teacher-pupil problems which we might meet. From our experience with the use of the films, we conclude that they can be used in the general educational psychology area in lieu of direct classroom observations with at least no loss in student learning and quite probably a gain. Besides, the film can serve well in many circumstances where direct observations in the classrooms are either impractical or impossible.